



the Skyscraper

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April 2016

AMATEUR ASTRONOMICAL SOCIETY OF RHODE ISLAND * 47 PEEPTOAD ROAD * NORTH SCITUATE, RHODE ISLAND 02857 * WWW.THESKYSCRAPERS.ORG

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Saturday, April 9, 7:00pm at Seagrave Memorial Observatory

Annual Meeting & The Effect of Meteor Impacts on the Hydrology of the Martian Crust by Cecilia Sanders

Our April speaker is Cecilia Sanders. She is a senior in the Department of Earth and Planetary Sciences at Harvard. Cecilia is interested in the origins of life in the universe and the ways in which the processes of planet formation have influenced the trajectory of life. Cecilia's research is supported by the Origins of Life Initiative, a collaboration of departments at Harvard. She will discuss her research and planetary geological processes. While an undergrad,

Cecilia has done research on the effect of meteor impacts on the hydrothermal processes in the Martian crust and investigated biomarker gases in exoplanet atmospheres. She has done research for JPL, Goddard Space Flight Center and Harvard.

Joining Cecilia will be Amanda Preston, the executive director of the Origins of Life Initiative. She will give up a brief overview of the research conducted by the initiative.

Renew Your Membership Today

Memberships are due in April. If you haven't renewed yet, please renew online at

www.theskyscrapers.org/join-renew

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Phases of the Moon

New Moon
April 7 11:24

First Quarter Moon
April 14 03:59

Full Pink Moon
April 22 05:24

Last Quarter Moon
April 30 03:29



Beginning Astronomy Workshops

Saturdays starting May 7



Seagrave Memorial Observatory Open Nights

Saturdays at 8:00 pm
weather permitting

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Proposed Skyscrapers Budget FY16-17

Skyscrapers 2016-17 budget will be voted on at the April 9 Annual Meeting.

Income	
AstroAssembly	\$4,175
Donations (Open Nights, Astronomy Day, Gifts, etc.)	\$1,500
Dues	\$3,665
Star Party Donations	\$700

Total Income \$10,040

Expenses

AstroAssembly	\$1,995
Contingency	\$305
Corporation Fees	\$20
Domain Name	\$20
Donations	\$50
Postage and Printing	\$150
Property & Liability Insurance	\$2,750
Refreshments	\$200
Property Maintenance (Trustees)	\$1,900
Utilities (Electricity, Gas, Sewage, Internet)	\$2,650

Total Expenses \$10,040

Friday, April 8: IBEX Comes to the URI Planetarium

University of Rhode Island Planetarium
Kingston Campus
Upper College Road
Friday, April 8th, 2016, 6:00 P.M.
Contact: Francine Jackson 401-527-5558

Much has been written as to where the solar system ends. Here, right above Earth, is a space craft with a mission as to where the influence of the Sun does just that. What has it learned? Is there any other proof as to how far the Sun is a factor within our galaxy. Come to the URI Planetarium and learn the extent of our neighborhood.

IBEX will be preceded by a short program on light pollution and its effects on the Earth, and followed by an introduction to the Skies over our Heads. Admission, to benefit the URI Planetarium Fund, is \$5.00.

The University of Rhode Island Planetarium is located on the URI campus, on Upper College Road, across from the Art Center. It is available for school and other group presentations. For further information, please call Francine Jackson at 401-527-5558.



The Skyscraper is published monthly by Skyscrapers, Inc. Meetings are held monthly, usually on the first or second Friday or Saturday of the month. Seagrave Memorial Observatory is open every Saturday night, weather permitting.

Directions

Directions to Seagrave Memorial Observatory are located on the back page of this newsletter.

Submissions

Submissions to The Skyscraper are always welcome. Please submit items for the newsletter no later than April 20 to Jim Hendrickson, 1 Sunflower Circle, North Providence, RI 02911 or e-mail to jim@distantgalaxy.com.

E-mail subscriptions

To receive The Skyscraper by e-mail, send e-mail with your name and address to jim@distantgalaxy.com. Note that you will no longer receive the newsletter by postal mail.

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A Few Astronomical Highlights for Stargazers

by Dave Huestis

Though March winds are supposed to bring April showers, I for one am looking forward to milder temperatures and clear skies as the Sun continues its northward journey through our sky, culminating with the Summer Solstice in June. Unfortunately a welcome shower of meteors called the April Lyrids is Full Moon(ed) out on the 20th this year, but there are several other astronomical highlights I recommend you try to work into your April observing schedule.

If you've never seen the planet Mercury with the naked-eye, then you should begin to look for this hellish world during the second week in April. At that time it will be sufficiently above the western horizon during dusk after sunset. Mercury will be a little brighter than Betelgeuse, the star marking Orion's right shoulder (remember, Orion is facing us). As the month progresses, Mercury will rise higher and higher into the sky, reaching its greatest altitude on the 18th. Need a guide to find it? Mercury will be ten degrees to the lower right of the Pleiades star cluster on that date. Each night thereafter it will sink lower and lower, finally disappearing back into the Sun's glare.

Mercury exhibits phases very much like the Moon. If you have a telescope and an unobstructed view of this region of the western sky, you can follow the progression of the phases. For example, on the 14th Mercury will resemble a first quarter Moon phase.

This brief appearance of Mercury is just the prelude to next month's transit of Mercury across the disk of the Sun. Since Mercury orbits between the Earth and our star, infrequently (13-14 times per century) it passes directly in front of the Sun as seen from our perspective. The next transit occurs on May 9. I will be highlighting this incredible event in my May column. It can only be viewed with properly filtered telescopes, so caution will be the key word for the day. However, local observatories are working on transit of Mercury observing programs, so stay tuned for future updates.

On April 10 another occultation of Aldebaran, Taurus the Bull's brightest star, will occur. As the waxing crescent Moon moves eastward in the sky, it covers the star at around 6:52 p.m. EDT along the Moon's dark limb/edge. With the Sun still above

the horizon, Aldebaran's disappearance will not be observable. However, an hour and five minutes later Aldebaran will reappear along the Moon's bright limb at approximately 7:57 p.m. EDT, with both objects about 34 degrees above the western horizon. Unaided eyes will suffice for the reappearance, though binoculars or a telescope will enhance the view.

Many folks were very fascinated by the alignment of planets the last few months. If you had to wake early for work, as soon as you stepped outside you couldn't help but see an arcing line of bright star-like objects stretching across the sky. Newspapers and the television media often brought this celestial parade to the attention of their patrons. While the beautiful alignment has since ceased as the planets comprising the grouping have since moved along in their respective orbits and our viewing angle has changed, between midnight and dawn on April 25 & 26 an observer can witness another wonderful grouping of astronomical objects.

A waning gibbous Moon will slide above Mars, Saturn and Scorpius' bright red star Antares (which means rival of Mars). Mars will be the bright orange (pumpkin colored) object, and Saturn, slightly yellowish in color, will be the left. Antares will be the red colored star below Mars. Try capturing an image. The configuration will surely fit within a single frame.

And finally, amid the hustle and bustle of this past holiday season, you may have missed the announcement of a possible new planet in our solar system. The discovery was made by Mike Brown, et al, the astronomer whose discovery of now dwarf planet Eris forced Pluto out of the planet club. Named Planet X (for unknown, not ten) or Planet Nine, its existence was postulated by the apparent influence it may have on dwarf planet Sedna and five other Kuiper Belt (realm of many comets and dwarf planets beyond Neptune's orbit) objects. To affect the orbits and alignments of these six objects, the new planet is computed to be up to four times the size of the Earth with a mass ten times that of our planet. At perihelion (closest point to the Sun) its highly elliptical orbit would put it at a distance of 20 billion miles, while at aphelion (farthest point from the sun) it could extend out to

112 billion miles. One Planet X orbit of the Sun could take upwards of 20,000 years. Note: the numbers attributed to this proposed new world are all estimates.

It has been speculated that either the 8.3 meter Subaru Telescope or the twin 10-meter telescopes at the Keck Observatory, both atop Mauna Kea in Hawaii, could possibly detect this distant world. And should it be discovered, it may take some time to determine if it meets the revised definition for a planet: has it cleared its orbit of other objects? Back in 2006 Pluto was demoted to dwarf planet status for failing that criteria. Only time and meticulous observations will solve this problem. Mike Brown may have killed Pluto as a planet, but perhaps he will bring life to a new one.

Explore the heavens at each of the facilities listed below. Sky interpreters are on hand to share their love of the sky with you. Seagrave Memorial Observatory (<http://www.theskyscrapers.org>) in North Scituate is open every clear Saturday night. Ladd Observatory (<http://www.brown.edu/Departments/Physics/Ladd/>) in Providence is open every clear Tuesday night. The Margaret M. Jacoby Observatory at the CCRI Knight Campus in Warwick (<http://www.ccri.edu/physics/observatory.htm>) is open every clear Wednesday night. Frosty Drew Observatory (<http://www.frostydrew.org/>) in Charlestown is open every clear Friday night. Check the respective websites for open times.

Keep your eyes to the skies.



Dave Huestis is Skyscrapers Historian and has been contributing monthly columns to local newspapers for nearly 40 years. See more at <http://theskyscrapers.org/dave-huestis>

The Sun, Moon & Planets in April

This table contains the ephemeris of the objects in the Solar System for each Saturday night in April. Times are in Eastern. Time calculated for Seagrave Observatory (41.845N, 71.590W).

Object	Date	RA	Dec	Const	Mag	Size	Elong	Phase(%)	Dist(S)	Dist(E)	Rise	Transit	Set
Sun	2	0 46.7	5 00.4	Psc	-26.8	1920	-	-	-	1	06:26	12:49	19:13
	9	1 12.3	7 39.3	Psc	-26.8	1916.1	-	-	-	1	06:14	12:47	19:21
	16	1 38.1	10 11.8	Psc	-26.8	1912.4	-	-	-	1	06:03	12:46	19:29
	23	2 04.2	12 36.0	Ari	-26.8	1908.8	-	-	-	1.01	05:52	12:44	19:36
	30	2 30.7	14 50.1	Ari	-26.8	1905.2	-	-	-	1.01	05:43	12:43	19:44
Moon	2	20 01.3	-16 38.6	Sgr	-11.5	1853	74° W	36	-	-	03:18	08:31	13:48
	9	2 37.4	10 45.5	Ari	-9.2	2007.2	22° E	4	-	-	07:56	15:00	22:12
	16	9 18.5	12 14.2	Cnc	-12.2	1846.6	112° E	68	-	-	14:23	21:13	03:55
	23	14 44.8	-12 09.5	Lib	-12.5	1768.4	171° W	99	-	-	20:05	01:32	06:54
	30	20 40.0	-15 16.5	Cap	-11.9	1848.8	92° W	52	-	-	01:57	07:15	12:38
Mercury	2	1 21.9	8 49.0	Psc	-1.4	5.4	10° E	92	0.31	1.25	06:50	13:27	20:07
	9	2 10.8	14 46.5	Ari	-0.9	6.1	16° E	73	0.31	1.11	06:48	13:48	20:49
	16	2 50.6	19 01.2	Ari	-0.1	7.3	20° E	48	0.34	0.93	06:42	13:59	21:16
	23	3 15.4	21 02.9	Ari	0.9	8.8	19° E	25	0.38	0.76	06:30	13:54	21:18
	30	3 22.2	20 49.3	Ari	2.4	10.6	14° E	9	0.41	0.64	06:10	13:31	20:52
Venus	2	23 45.5	-3 10.1	Psc	-3.8	10.5	17° W	96	0.73	1.62	05:56	11:49	17:42
	9	0 17.3	0 14.5	Psc	-3.8	10.3	16° W	96	0.73	1.64	05:48	11:53	17:59
	16	0 49.1	3 39.7	Psc	-3.8	10.2	14° W	97	0.73	1.66	05:40	11:57	18:15
	23	1 21.0	7 01.6	Psc	-3.8	10.1	12° W	98	0.73	1.68	05:32	12:01	18:32
	30	1 53.3	10 16.1	Psc	-3.8	10.0	10° W	98	0.73	1.69	05:25	12:06	18:48
Mars	2	16 23.5	-20 43.0	Oph	-0.6	12.0	125° W	93	1.58	0.78	23:42	04:25	09:09
	9	16 27.4	-21 02.3	Oph	-0.8	12.9	131° W	94	1.58	0.73	23:19	04:01	08:43
	16	16 29.0	-21 18.4	Oph	-1	13.9	138° W	95	1.57	0.67	22:55	03:35	08:16
	23	16 28.1	-21 31.3	Oph	-1.2	14.9	145° W	96	1.56	0.63	22:27	03:07	07:47
	30	16 24.6	-21 40.7	Oph	-1.5	16.0	152° W	98	1.55	0.59	21:57	02:36	07:15
1 Ceres	2	23 55.1	-9 18.7	Aqr	9.2	0.3	19° W	100	2.97	3.89	06:27	11:56	17:25
	9	0 05.1	-8 17.8	Cet	9.2	0.3	23° W	100	2.97	3.86	06:06	11:39	17:12
	16	0 15.1	-7 18.2	Cet	9.2	0.3	27° W	99	2.96	3.82	05:45	11:21	16:58
	23	0 24.9	-6 20.1	Cet	9.3	0.3	31° W	99	2.96	3.78	05:23	11:03	16:43
	30	0 34.5	-5 23.9	Cet	9.3	0.3	35° W	99	2.96	3.73	05:02	10:45	16:29
Jupiter	2	11 08.2	7 08.1	Leo	-2.3	43.5	153° E	100	5.43	4.52	16:38	23:06	05:34
	9	11 05.7	7 23.0	Leo	-2.2	42.9	145° E	100	5.43	4.58	16:07	22:36	05:05
	16	11 03.6	7 35.0	Leo	-2.2	42.3	138° E	100	5.43	4.65	15:37	22:07	04:36
	23	11 02.0	7 43.6	Leo	-2.2	41.6	130° E	100	5.43	4.73	15:08	21:38	04:08
	30	11 01.0	7 48.9	Leo	-2.1	40.8	123° E	99	5.44	4.82	14:39	21:09	03:39
Saturn	2	17 01.5	-20 58.7	Oph	0.3	17.4	116° W	100	10.02	9.54	00:20	05:03	09:45
	9	17 01.0	-20 57.2	Oph	0.3	17.5	123° W	100	10.02	9.44	23:52	04:35	09:17
	16	17 00.1	-20 55.3	Oph	0.3	17.7	130° W	100	10.02	9.34	23:24	04:06	08:49
	23	16 58.9	-20 53.1	Oph	0.2	17.9	138° W	100	10.02	9.26	22:55	03:38	08:20
	30	16 57.5	-20 50.5	Oph	0.2	18.0	145° W	100	10.03	9.19	22:26	03:09	07:52
Uranus	2	1 14.8	7 16.1	Psc	5.9	3.4	7° E	100	19.97	20.96	06:47	13:15	19:43
	9	1 16.3	7 25.2	Psc	5.9	3.4	1° E	100	19.97	20.97	06:20	12:49	19:18
	16	1 17.8	7 34.2	Psc	5.9	3.4	6° W	100	19.97	20.96	05:53	12:23	18:52
	23	1 19.2	7 43.2	Psc	5.9	3.4	12° W	100	19.96	20.95	05:27	11:57	18:27
	30	1 20.7	7 51.9	Psc	5.9	3.4	19° W	100	19.96	20.92	05:00	11:31	18:01
Neptune	2	22 50.0	-8 17.6	Aqr	8.0	2.2	32° W	100	29.96	30.8	05:18	10:50	16:23
	9	22 50.8	-8 12.6	Aqr	8.0	2.2	39° W	100	29.96	30.73	04:51	10:24	15:56
	16	22 51.6	-8 08.0	Aqr	7.9	2.2	45° W	100	29.96	30.65	04:24	09:57	15:30
	23	22 52.3	-8 03.8	Aqr	7.9	2.2	52° W	100	29.96	30.57	03:57	09:30	15:03
	30	22 53.0	-8 00.1	Aqr	7.9	2.2	59° W	100	29.96	30.47	03:30	09:03	14:37
Pluto	2	19 14.7	-20 49.8	Sgr	14.3	0.2	85° W	100	33.07	33.14	02:33	07:16	11:59
	9	19 14.9	-20 49.8	Sgr	14.2	0.2	92° W	100	33.08	33.02	02:05	06:48	11:31
	16	19 15.0	-20 50.0	Sgr	14.2	0.2	99° W	100	33.08	32.91	01:38	06:21	11:04
	23	19 15.0	-20 50.4	Sgr	14.2	0.3	106° W	100	33.08	32.8	01:10	05:53	10:36
	30	19 14.8	-20 51.0	Sgr	14.2	0.3	113° W	100	33.09	32.69	00:43	05:26	10:09

Peculiar Galaxy in Ursa Major

NGC 3077

by Las Vegas Astronomical Society

(Magnitude – 9.9, Dimensions – 5.5' X 4.0')

NGC 3077 is a small member of the M81 Group, visible in the same low power field as M81 and M82. It was discovered by William Herschel on November 8, 1801. To the casual observer, NGC 3077 looks like an elliptical galaxy. However, it is classified as a peculiar irregular galaxy due to its wispy edges, scattered dust clouds, and active nucleus. Studies suggest a distance for NGC 3077 of 13 million light years.

The purpose of the LVAS Observer's Challenge is to encourage the pursuit of visual observing. It is open to everyone that is interested, and if you are able to contribute notes, drawings, or photographs, the LVAS will be happy to include them in our monthly summary. If you would like to contribute material, submit your observing notes, sketches, and/or images to either Roger Ivester (rogerivester@me.com) or Fred Rayworth (queex@embarqmail.com). To find out more about the LVAS Observer's Challenge or access past reports, log on to lvastronomy.com/observing-challenge.



Astronomy Magazine



Russeli Croman (www.rc-astro.com)

Skyscrapers March Meeting Minutes — 3/4/2016

President Bob Horton called the Skyscrapers' March meeting to order at 7:30 p.m.

President Bob Horton welcomed everyone to the meeting. He explained that next month the organization will meet back at Seagrave. • Bob reminded everyone that the Observatory is open every Saturday night, weather permitting.

Membership report: The following individuals were voted into membership: Steve and Maria Brown, Kerry and Linda Hurd, and Jack Mertz.

Trustee Report: Tom Thibault reported that there has been a problem with the Observatory's slit. He noted that this issue is not a new one and may require a work party to repair the slit sometime in the near future. Tom said that he will check on it tomorrow to determine whether its condition will affect closing the Observatory for Saturday's open night. • Tom told the membership that Senior Trustee Jim Crawford suffered a broken bone in his leg and will be out of commission for a while.

2015 Budget: The President noted that Treasurer Ed Haskell was not in attendance tonight, so the proposed budget will be included in the newsletter and will be ready for approval at the annual meeting in April.

Election Committee Report: On behalf of the Nominating Committee, Tom Thibault announced the following nominations: President, Steve Siok; First Vice President, Ian Dell-Antonio; Second Vice President, Kathy Siok; Secretary, Steve Hubbard; Treasurer, Lloyd Merrill; and Member at Large, Tracy Prell. • Bob opened the floor for nominations for all positions. None were received and a motion to close nominations was seconded. • It was noted that ballots will be sent to the membership prior to the annual meeting where voting will occur in April. • Tom reported that one Member at Large and one Trustee position remain unfilled. These vacancies will be addressed in a subsequent election. If anyone is interested, see Tom or Bob following the meeting.

For the Good of the Organization: Francine Jackson remarked that the next URI planetarium show, "Cosmic Colors," will be on Friday, March 11. • She also noted that the last star party was held in January at the Newport Art Museum. There will be another opportunity at the Newport

Art Museum this Thursday evening. • Suzanne Buchanan, Volunteer Director for the Blackstone River Valley National Heritage Corridor, spoke to the membership about the benefits of becoming a participant in their "Volunteers in Parks" program (VIP). It was noted that Skyscrapers held a very successful star party in the past at the River Bend Farm, which could certainly be repeated. • Bob noted that the Society has been very active with star parties and cited the one in Lincoln Woods for the Governor's "Great Outdoors" event and also at the Rhode Island State House in coordination with the President's "White House" star party. • Bob reported that there will be an Executive Board meeting scheduled in a few weeks and a notice will be sent with those details.

Grant Update: Ian Dell-Antonio reported that the only components of the grant to finish for the 27-inch telescope project are the budget for the dome and the building. He said that the draft grant proposal has been shared with other schools (CCRI, Roger Williams University, Rhode Island College, and University of Rhode Island) and has gathered a lot of momentum and interest by these institutions in participating as a statewide resource. • Ian noted that the Champlins Foundation's date for first grant application submission is April 30. He noted that the grant will also be sent to multiple agencies for consideration as well. • If you are interested in learning more about the grant project, contact Ian.

First Vice-President Report: Steve Siok gave an update on the upcoming calendar of speakers and topics through August. He noted that the April meeting will feature two presenters from Harvard, one on the subject of water on Mars and the other on the origins of life in the galaxy. • Steve noted that the August meeting will include an opportunity for members to tell about their plans for the 2017 eclipse. If you are interested in contributing, contact Steve.

The meeting adjourned at 8:00. Submitted by Tina Huestis, Secretary.

Gordon Blackadder, Brown University, presented his program "Decaying Dark Matter and the Expanding Universe." Gordon Blackadder provided background on cosmology as well as Hubble's Law. With this information, he used the analogy of a loaf of raisin bread to illustrate how galaxies were moving. He explained that the rai-

sins (or galaxies) weren't in fact the ones in motion, but it was actually that the bread was rising. The space between the galaxies (raisins) is constant as the space between them increases. Gordon said that in looking at the universe, everything is moving all of the time, and by using a map (with grid coordinates), it helps to relate the galaxies back to their physical coordinates. As the universe expands, light moves to lower frequencies that stretch the light wave, called redshifting. When light redshifts, it decreases in energy. Gordon explained that dark matter doesn't interact with light. His research attempted to observe this expansion of the universe by examining the curve of super nova.



Gordon Blackadder

Board of Directors Meeting Minutes — 3/24/16

Attendees: Jim Crawford, Ian Dell-Antonio, Bob Horton, Tina Huestis, Francine Jackson, Lloyd Merrill, Bob Napier, Tracy Prell, Steve Siok, and Tom Thibault.

President Bob Horton called the meeting to order at 7:20 p.m. at Seagrave Observatory.

Membership: Jim Crawford reported that the database has been updated for members in good standing for 2015. He will provide this final list to the Elections Committee for sending election ballots, as well as to others for newsletter emailing and secretarial purposes. • Jim indicated that he will continue maintaining the database until he can transfer/train the incoming officers on set-up and procedures. • It was noted that

dues for the upcoming year are being collected and there were some renewals in the mail. • Bob Horton said that there were no new members to report at this time.

Financial Report: Lloyd Merrill reported that the Financial Report is not finished as he is awaiting information from Treasurer Ed Haskell. They are working closely to finalize accounts. Lloyd expects to have a final report by next meeting.

2016–2017 Budget: Bob Horton distributed copies of the 2016–17 budget, which he put together after meeting with Lloyd and Ed. Bob noted that it closely followed last year's and will be the budget going forward. He explained that the Society's income sources are expected to continue unchanged: AstroAssembly, dues (e.g., member retention / new members), general donations, and star party donations. And conversely, expenses will continue as before: AstroAssembly, meeting refreshments, property maintenance, utilities, port-a-john, internet, and insurance. • Steve Siok said that the savings of not having to rent tent/chairs for AstroAssembly was offset by lower attendance due to poor weather. He recalled that the new evening buffet format was well received and added to the overall savings. • Tracy Prell announced that she will donate \$1,000 towards 2016 AstroAssembly expenses. The Board was extremely appreciative and thanked Tracy for her donation. • Bob said that Jim Hendrickson will publish the 2016–17 budget in the newsletter, which will be voted on at the Annual Meeting. • It was noted that the Society's annual audit will take place once all record keeping is up to date. Bob Horton explained that the new incoming President will appoint someone to perform the audit.

Election Committee: Francine Jackson reported that ballots were well underway and everything should be mailed out by the weekend.

Star Parties: Francine told the group that URI's upcoming planetarium program is scheduled for April 8 at 6:00 p.m. on campus. • She noted that the next second Thursday of the month star party in Newport will be April 14 at 7:00 p.m. After some discussion on the benefits of volunteering as far afield as Newport, Bob Horton said that he will contact the Newport Art Museum to discuss charging for our participation and verify the number of volunteers needed. • He noted that this Saturday night, Dick Parker will be bringing Cub Scouts to the observatory and is asking for extra help since it also falls on Easter weekend.

An email will be sent to the membership seeking volunteers, if anyone can help contact Bob directly. • Francine noted that the Blackstone River Valley National Heritage Corridor's "Go" book has a May publishing deadline. If Skyscrapers wants to consider participating and being included in the book, we would need to have details ready to meet their publication schedule. It was noted that the observatory's property falls outside of the National Heritage Corridor. • Francine said that the "Observe the Moon" night for 2016 falls on Saturday, October 8 (Columbus Day weekend). • It was noted that the Skyscrapers' quarterly workshop series will resume on May 7 with Ian Dell-Antonio's Sun program. Ian said that he will include the transit of Mercury in his presentation. Since this first workshop in the series covers the subject of the Sun, it will begin at 6:00 p.m. Subsequent programs should begin at a later time in the evening.

Trustees' Report: Jim Crawford has inventoried the property keys and reported that they are up-to-date. • Jim told the group that the port-a-john will arrive March 31st and he plans to be on premises for that delivery. They will try to situate the unit closer to the kiosk so that its outdoor light will shine down to provide some needed illumination. • Jim said that the Trustees will be replacing the plants on the neighbor's property line abutting our driveway. • Also the Trustees are recommending extending the exterminator's usual (four times a year) services to include extra treatments during the summer. This debugging is part of the routine property maintenance. • Tom Thibault reported that the slit on the Clark's dome was moved out of its track, most likely due to the wind. We may consider adding "L" brackets to prevent the dome from lifting off in the future. Also the skirt around the top needs rebuilding, which will likely be a summer project. • The grass cutting at the Seagrave property will probably start up again in April. Tom noted that the tractor should be given some maintenance with a new blade and bed alignment prior to its first use. Other projects in scope for 2016 include: resetting the floor tiles and painting the basement of the main observatory, repairing windows, roll-off repairs (screwing the South and West pieces), and clean up of the large shrubs. • Jim added that the facility inventory needs to be done by the Trustees and maintained going forward. Also each telescope needs a cover. These projects will be discussed with

the new Trustees following the election.

Large Remote-Controlled Telescope: Ian reported on the grant progress. He has completed a new version, which has been shortened to the preferred (Champlin) length of five to ten pages. • He has received letters of support from local colleges/universities and has met with the Brown Foundation. • Ian is hopeful that the final details necessary for the Deputy Provost's approval can be resolved by the April 30 Champlin deadline. • Ian noted that the Champlin notification time frame is in December. • It was explained that this telescope order usually takes between nine to 12 months to fulfill, so the project's expected finish will be approximately two years.

Administrative Transition: Bob Horton expressed that outgoing officers should contact the person who will be taking over in their role to ensure that there is a smooth transition following the election.

Light Committee: Francine asked the Board to reconsider her earlier request to help combat the expected light pollution that will be caused with the creation of a new Citizens 100-acre complex in nearby Johnston. There are plans of adding a new exit off of Interstate 295 between exits 6 & 7. She noted that public comment hearings will be held and that the Society should be involved in the effort to restrain light pollution, especially since the organization is working towards installing a 27-inch telescope on its grounds. • It was noted that the Light Committee should have a goal in 2016 to develop materials and a stance on mitigating the effects of light pollution.

Security Cameras: Bob Napier showed the group a clip of some outdoor camera footage that he took during AstroAssembly 2014 as an example of what could be expected with the installation of security cameras on the property. • Lloyd has an expert that can consult (at no cost) about how best to address our security camera needs. He will work with that individual and provide a recommendation to the Board.

Miscellaneous: Tracy reminded everyone to select Skyscrapers from the charity listing when purchasing via Amazon Smile (www.smile.amazon.com). She explained that when our members return to Amazon.com to make another purchase that same or another day, they must ensure to go to www.smile.amazon.com for Skyscrapers to receive the donation.

Meeting adjourned at 8:54. Submitted by Tina Huestis, Secretary

How Faint Can You "CCD"?

by Conrad Cardano

In March 1989, *Sky & Telescope* published an article requesting amateur astronomers to send in observations of the faintest star seen in open cluster M67. A very detailed photo of M67, with star magnitudes, was included in the article. With

my 10" dobsonian, I was able to observe 14th magnitude stars at high magnification.

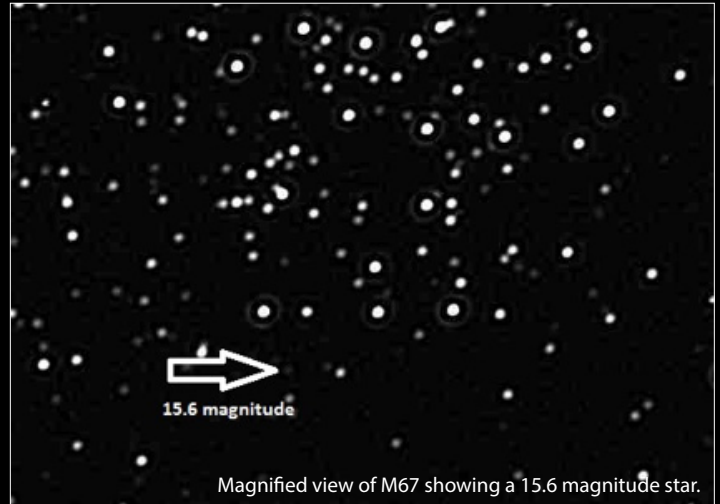
Now that I do all of my observing with cameras, I always wondered how faint could I see with a camera.

Here are the results.

Telescope used: ES 102mm f/7 refractor; Camera used: Canon T1i Rebel at ISO 1600; Five 30 second exposures were taken and stacked using Astro Art software.



Full view of open cluster M67.



Magnified view of M67 showing a 15.6 magnitude star.



I took this picture last night and thought I would share it with all of you. It is M65, M66 and NGC 3628 in the same frame. There are 35 one-minute exposures that have been stacked and processed by Astro Art. I used a Canon T1i Rebel camera on a ES 102mm refractor. Image by Conrad Cardano on March 29.



Quick processed shot of last nights target the Rosetta Nebula. (4) 5 min and (20) 4 min unguided exposures. Photo by Tom Thibault on March 11.



Bob Horton took this photo of Orion & the Winter Sky setting over Furnace Creek in Death Valley National Park in late March.



Gravitational Wave Astronomy Will Be The Next Great Scientific Frontier

by Ethan Siegel

Imagine a world very different from our own: permanently shrouded in clouds, where the sky was never seen. Never had anyone see the Sun, the Moon, the stars or planets, until one night, a single bright object shone through. Imagine that you saw not only a bright point of light against a dark backdrop of sky, but that you could see a banded structure, a ringed system around it and perhaps even a bright satellite: a moon. That's the magnitude of what LIGO (the Laser Interferometer Gravitational-wave Observatory) saw, when it directly detected gravitational waves for the first time.

An unavoidable prediction of Einstein's General Relativity, gravitational waves emerge whenever a mass gets accelerated. For most systems -- like Earth orbiting the Sun -- the waves are so weak that it would take many times the age of the Universe to notice. But when very massive objects orbit at very short distances, the orbits decay noticeably and rapidly, producing potentially observable gravitational waves. Systems such as the binary pulsar PSR B1913+16 [the subtlety here is that binary pulsars may contain a single neutron star, so it's best to be specific], where two neutron stars orbit one another at very short distances, had previously shown this phenomenon of orbital decay, but gravitational waves had never been directly detected until now.

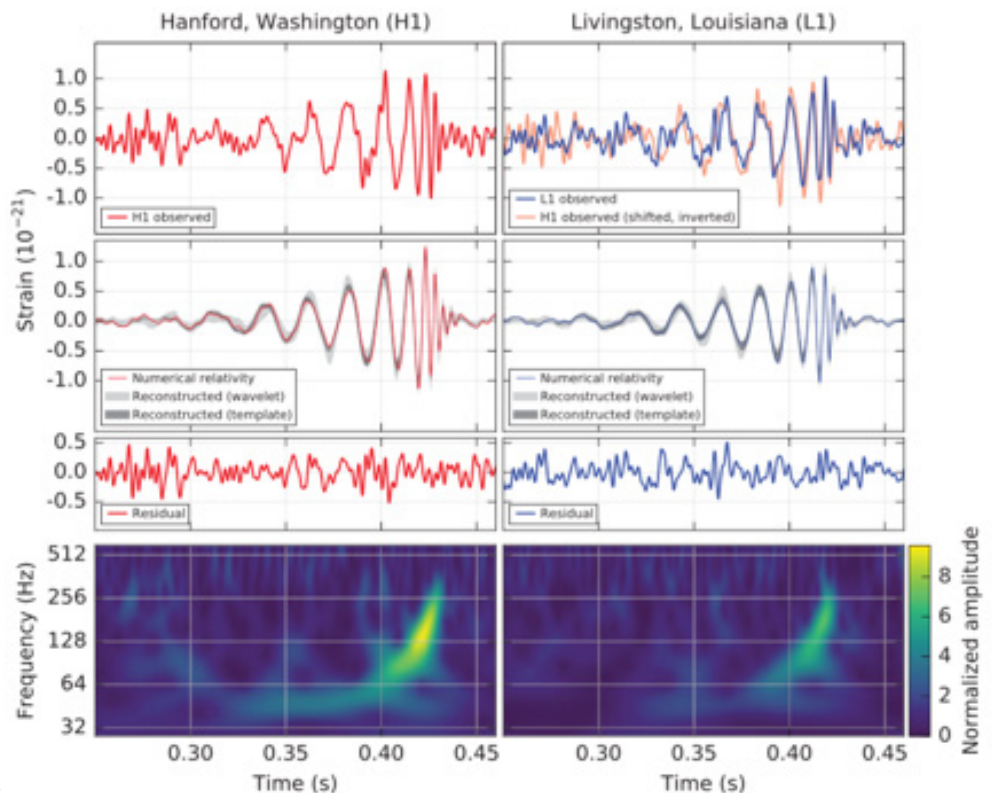
When a gravitational wave passes through an objects, it simultaneously stretches and compresses space along mutually perpendicular directions: first horizontally, then vertically, in an oscillating fashion. The LIGO detectors work by splitting a laser beam into perpendicular "arms," letting the beams reflect back and forth in each arm hundreds of times (for an effective path lengths of hundreds of km), and then recombining them at a photodetector. The interference pattern seen there will shift, predictably, if gravitational waves pass through and change the effective path lengths of the

arms. Over a span of 20 milliseconds on September 14, 2015, both LIGO detectors (in Louisiana and Washington) saw identical stretching-and-compressing patterns. From that tiny amount of data, scientists were able to conclude that two black holes, of 36 and 29 solar masses apiece, merged together, emitting 5% of their total mass into gravitational wave energy, via Einstein's $E = mc^2$.

During that event, more energy was emitted in gravitational waves than by all the stars in the observable Universe combined. The entire Earth was compressed by less than the width of a proton during this event, yet thanks to LIGO's incredible precision, we were able to detect it. At least a handful

of these events are expected every year. In the future, different observatories, such as NANOGrav (which uses radiotelescopes to the delay caused by gravitational waves on pulsar radiation) and the space mission LISA will detect gravitational waves from supermassive black holes and many other sources. We've just seen our first event using a new type of astronomy, and can now test black holes and gravity like never before.

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!



Observation of Gravitational Waves from a Binary Black Hole Merger B. P. Abbott et al., (LIGO Scientific Collaboration and Virgo Collaboration), Physical Review Letters 116, 061102 (2016). This figure shows the data (top panels) at the Washington and Louisiana LIGO stations, the predicted signal from Einstein's theory (middle panels), and the inferred signals (bottom panels). The signals matched perfectly in both detectors.

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The Upcoming Transit of Mercury

by Francine Jackson

Although it's not happening until next month, we really should prepare for something that doesn't happen very often, and that caused major changes in history. Next month, on May 9th, the tiny planet Mercury will pass directly in front of, or transit, the Sun. Yes, for those of you who were fortunate to see one or both of the Venus transits in 2004 and 2012, the little ball that will be Mercury might not be as exciting as Venus, but there is history that should be kept in mind.

Only our two inferior planets, Mercury and Venus, can pass in front of the Sun, from our perspective. Venus does so in one of the more unique cycles in nature: four times in 243 years. Mercury, on the other hand, does transit more often, about a dozen times per century, but of course, being New England, viewing any of these phenomena is difficult with our weather patterns; however, if we do have a good morning Monday, May 9th, consider preparing yourself for observing

something that doesn't happen very often, for the next one won't be until November, 2019.

The first observed Mercury transit was in 1631, by Pierre Gassendi, who tried, and failed, to also be the first to observe Venus that same year. However, it was Edmund Halley, the comet guy, who, while spending three years observing the skies on the island of St. Helena, not only observed Mercury transit the Sun, but realized that this configuration, of a body passing in front of the Sun, could be used to mathematically determine the distance between the Earth and the Sun, the astronomical unit, the standard for the distances to all the planets. As Mercury is so small, Halley realized that observing Venus would be a much easier planet to utilize. This concept became the focus of observing journeys around the world for centuries.

Observing Mercury transit the Sun is not an easy thing to do, as you must be very careful, as you will be looking directly at the

Sun, and must take all precautions necessary to avoid hurting your eye. If the skies are clear, Ladd Observatory will be open for safe viewing from sunrise to Mercury's exit from the ball of the Sun in the early afternoon. Also, Ian Dell'Antonio will be speaking on Mercury transits Saturday, May 7th, as part of his famous Sun presentation, which will be the opening to the Skyscrapers springtime set of workshops. As Mercury won't transit the Sun for another three years, please make every effort to both learn more about this historic event and observe something that doesn't happen very often.



Francine Jackson is Skyscrapers Public Relations Spokesperson, writes the weekly newsletter for Ladd Observatory and serves as planetarian at the University of Rhode Island. See more at <http://theskyscrapers.org/francine-jackson>

Directions to Seagrave Memorial Observatory

From the Providence area:

Take Rt. 6 West to Interstate 295 in Johnston and proceed west on Rt. 6 to Scituate. In Scituate bear right off Rt. 6 onto Rt. 101. Turn right onto Rt. 116 North. Peeptoad Road is the first left off Rt. 116.

From Coventry/West Warwick area:

Take Rt. 116 North. Peeptoad Road is the first left after crossing Rt. 101.

From Southern Rhode Island:

Take Interstate 95 North. Exit onto Interstate 295 North in Warwick (left exit.) Exit to Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

From Northern Rhode Island:

Take Rt. 116 South. Follow Rt. 116 thru Greenville. Turn left at Knight's Farm intersection (Rt. 116 turns left) and follow Rt. 116. Watch for Peeptoad Road on the right.

From Connecticut:

- Take Rt. 44 East to Greenville and turn right on Rt. 116 South. Turn left at Knight's Farm intersection (Rt. 116 turn left) and follow Rt. 116. Watch for Peeptoad Road on the right.
- or • Take Rt. 6 East toward Rhode Island; bear left on Rt. 101 East and continue to intersection with Rt. 116. Turn left; Peeptoad Road is the first left off Rt. 116.

From Massachusetts:

Take Interstate 295 South (off Interstate 95 in Attleboro). Exit onto Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.



47 Peeptoad Road
North Scituate, Rhode Island 02857